

WHAT IS CLAIMED IS:

1. A device for temperature compensation, comprising:  
a composite plate comprising plural fiber reinforced laminae, each of which has a designed fiber orientation, and having a specific temperature-dependent characteristic in a direction, for compensating an optical component positioned thereon and having a temperature-dependent deformation,  
wherein said specific temperature-dependent characteristic is determined by said designed fiber orientation of said plural fiber laminae.
2. A device as in claim 1 wherein said optical component includes fiber Bragg gratings.
3. A device as in claim 1 wherein said optical component includes a waveguide.
4. A device as in claim 3 wherein said optical component includes fiber Bragg gratings.
5. A device as in claim 1 wherein said specific temperature-dependent characteristic has a designable coefficient of thermal expansion in said direction.
6. A device as in claim 1 wherein each of said plural fiber laminae is made of reinforcing continuous fibers.
7. A device as in claim 6 wherein said composite plate is manufactured by consolidating a designed three dimensional array of said reinforcing continuous fibers and a matrix.
8. A device as in claim 7 wherein said matrix is a polymeric resin for binding said reinforcing continuous fibers together.

9. A device as in claim 1 wherein said composite plate is fixed in a compartment at one end thereof and the other end free, and said compartment is sealed to isolate the influence of external temperature fluctuations.

10. A device of claim 9 wherein a vacuum is created inside said compartment to alleviate heat conduction to said optical component under temperature compensation by convection and conduction.

11. A device of claim 9 wherein the said compartment is coated all around by a low thermal conducting material to alleviate heat conduction into said compartment.

12. A device as in claim 9 wherein an internal surface of said compartment is plated with a material having a low emissivity and a high reflectivity to alleviate heat conduction to said optical component under temperature compensation by radiation.

13. A device as in claim 9 wherein an external surface of said compartment is plated with a material having a low emissivity and a high reflectivity to alleviate heat conduction to said optical component under temperature compensation by radiation.

14. A device as in claim 9 wherein a dead weight or adjustable mechanism is attached to said composite plate to allow pre-tuning of optical characteristics of said optical component without scarifying a temperature compensation capability of said composite plate.

15. A method for temperature compensation, comprising steps of:  
providing a composite plate comprising plural fiber laminae, each of which has a designed fiber orientation, and having a specific temperature-dependent characteristic in a direction; and

bonding an optical component having a temperature-dependent deformation

along said direction on said composite plate so as to compensate said deformation through said specific temperature-dependent characteristic,

wherein said specific temperature-dependent characteristic is determined by said designed fiber orientations of said fiber laminae.

16. A method as in claim 15 wherein said optical component includes fiber Bragg gratings.

17. A method as in claim 15 wherein said optical component includes a waveguide.

18. A method as in claim 17 wherein said optical component includes fiber Bragg gratings.

19. A method as in claim 15 wherein said composite plate provides a contraction during temperature rise and an expansion during temperature drop.

20. A method as in claim 15 wherein said composite plate is fabricated by steps of:

providing said plural fiber laminae;

cutting said fiber laminae into specific size and shape;

stacking said fiber laminae with a designed sequence of said fiber orientations;

consolidating said stacked fiber laminae under appropriate temperature and pressure in a suitable mold into said composite plate; and

cutting said consolidated composite plate into a required size.

21. A method as in claim 20 wherein each of said fiber laminae is a prepreg of resin pre-impregnated fiber lamina.

22. A method as in claim 15 wherein said composite plate is consolidated by different molds tooling into a plate having one of a flat and a curved shape.

23. A device as in claim 15 wherein said composite plate is fixed in a compartment at one end thereof and has a free the other end, and said compartment is sealed to isolate the influence of external temperature fluctuations.

24. A device of claim 23 wherein a vacuum is created inside said compartment to alleviate heat conduction to said optical component under temperature compensation by convection and conduction.

25. A device of claim 23 wherein the said compartment is coated all around by a low thermal conducting material to alleviate heat conduction into said compartment.

26. A device as in claim 23 wherein an internal surface of said compartment is plated with a material having a low emissivity and a high reflectivity to alleviate heat throughput to said optical component under temperature compensation by radiation.

27. A device as in claim 23 wherein an external surface of said compartment is plated with a material having a low emissivity and a high reflectivity to alleviate heat throughput to said optical component under temperature compensation by radiation.

28. A device as in claim 23 wherein a dead weight or adjustable mechanism is attached to said composite plate to allow pre-tuning of optical characteristics of said optical component without scarifying a temperature compensation capability of said composite plate.